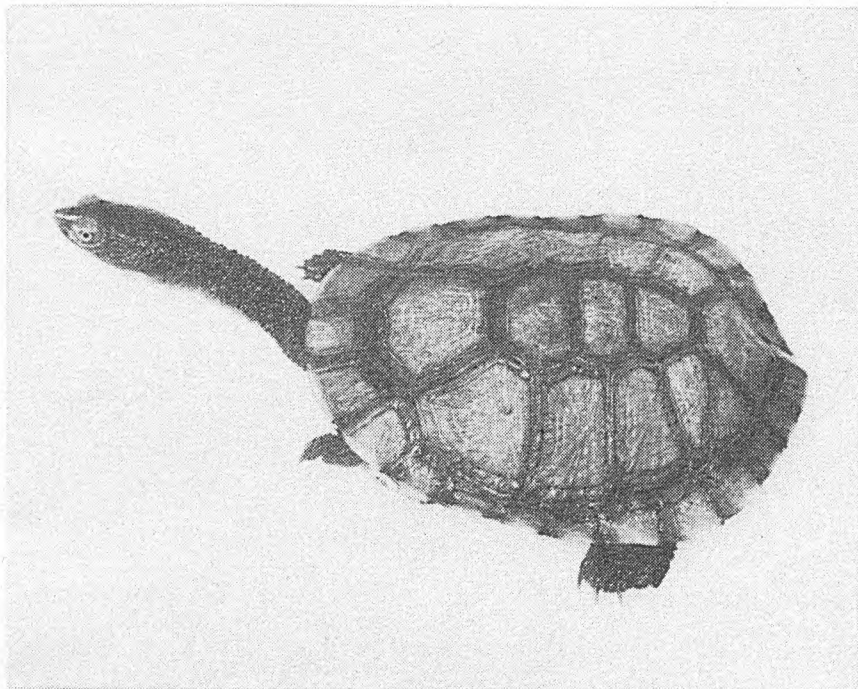


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# HERPETOFAUNA

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Chelodina longicollis

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# EDITORIAL.

The discussion generated at the recent Convention regarding Herpetofauna highlighted the wide range of readers this journal reaches. On one hand there was a request for more scientific material and on the other a request for less technical articles. Many other ideas were put forward all of which will be considered. It must be remembered that we can only publish what we are offered. If more habitat, or captivity, or scientific material is wanted then it must be submitted.

At the second Convention in Whyalla, Graeme Gow, Curator of Natural Sciences at the Northern Territory Museum very kindly offered to donate book prizes to developing writers who publish in Herpetofauna.

Up to three prizes per issue for articles and two prizes per issue for herpetological notes are to be offered. Writers who have had two or less articles and/or notes published are eligible. If you consider that you are eligible, please indicate this on your contribution to Herpetofauna. The judges shall be Graeme Gow and Gerry Swan and they will arrange the posting of book prizes to winning authors after publication.

The Affiliation is most grateful to Graeme Gow for his generous gesture; we hope it will stimulate the writing of more articles for Herpetofauna.

Costs are a limiting factor in producing Herpetofauna and the present price has not changed over the past three years, unfortunately this cannot be maintained. It is becoming increasingly difficult to produce the journal within a budget and in fact it is only because much of the preparatory work is done on a voluntary basis and many incidental expenses and postage costs are not claimed that publication has continued.

If therefore Herpetofauna is to improve in quality of production or indeed to simply maintain present standards we can see no alternative to a price increase as from the next issue. The actual increase will need to be agreed upon by the member societies but at this stage an increase of at least 50% and possibly even 100% may be needed to place the journal on a solid base for future development.

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## COVER PHOTOGRAPH

Long-necked Tortoise (Chelodina longicollis)  
Photograph supplied by Dr. H.G.Cogger.

# Notes on the Status of the 'Blind' Snake Typhlina towelli (Loveridge).

by M.W. Gillam, Territory Parks and Wildlife Comm., Alice Springs, N.T.

## SUMMARY

The status of Typhlina towelli is investigated with special emphasis on the reliability of the feature used to distinguish it from Typhlina diversa.

## INTRODUCTION

Robb (1966) initially divided the Typhlopidae of New Guinea and the Solomons into two distinctive genera (Typhlops and Rhamphotyphlops) on the basis of male genital structure. McDowell (1974) in his work on material from the same regions accepted this division but he resurrected Typhlina (Wagler, 1830) to replace by precedence Rhamphotyphlops (Robb, 1966).

With the exception of recent work by McDowell (1974) the systematics of Australian 'Typhlopids' remain virtually unchanged since the detailed studies of E.R. Waite during the early part of this century. Cogger (1975) lists 22 known species from the Australian region. Of this number some 15 species are represented in the Northern Territory including four which are endemic.

Due to the limited external diagnostic characters available for this group, identification is often difficult. The external characters most widely used to distinguish species are features of head scalation (in particular the position of the nasal cleft) and the number of scale rows at the midbody. Further characters used extensively by S.B. McDowell (1974) are: the form and ornamentation of the hemipenis; form of the retrocloacal sacs (in Typhlina); presence or absence of a rectal caecum; pattern of imbrication of the supralabials with other head scutes; distribution of cutaneous glands on the head; development of lateral papillae on the tongue.

The placement of Typhlina towelli within Typhlina is only tentative as it was not confirmed by an examination of male genitalia. Subsequent examination of both type specimens, however, reveals them to be females.

Since its description Typhlina towelli (Loveridge, 1945) has been virtually ignored and certainly it was not mentioned by McDowell (1974), Kinghorn (1929), Worrell (1963) and Gow (1976). It is only in recent times (Cogger, 1975) that the species has reappeared in the literature.

## Typhlina towelli, Loveridge (1945)

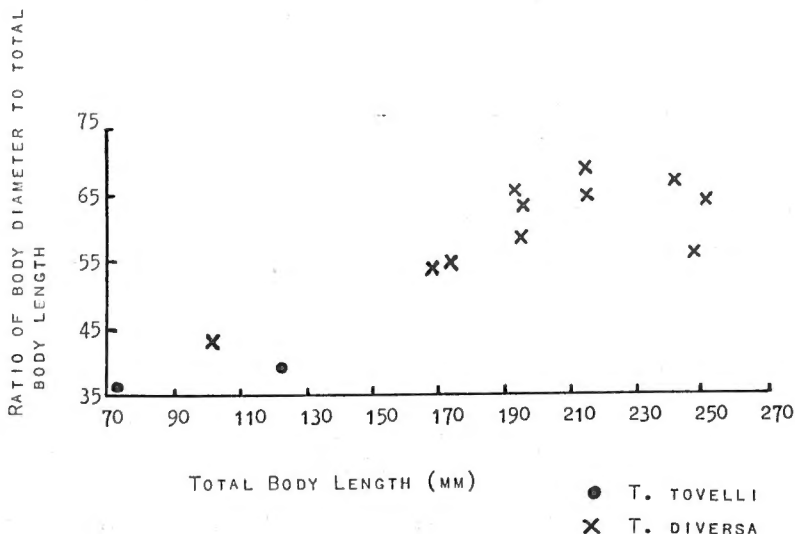
Typhlina towelli is known only from the holotype and a single paratype Nos. 488-5. They are lodged in the Museum of Comparative Zoology (MCZ) Harvard College, Massachusetts, U.S.A. Both specimens were collected for Loveridge by G.T.R. Tovell of the Australian forces stationed in Darwin. This specimen was subsequently named in his honour (Loveridge 1945). The two specimens were collected in 1944 at Koonowarra sports

ground, about five miles south of Darwin, Northern Territory. This locality is within the general distribution of Typhlina diversa which is known from widely scattered localities of Northern Australia. (Cogger, 1975).

In his diagnosis of Typhlina towelli Loveridge concluded that it was closely related to Typhlina broomi (Boulenger) of which he thought it could be a subspecies. He separated Typhlina towelli from Typhlina broomi by the presence of a semi-divided (not divided) labial. Loveridge further suggested that Typhlina towelli had less in common with Typhlina diversa (Waite). After examining only the type of Typhlina diversa he decided that both species were readily distinguishable on the ratio of body diameter to total body length. The Typhlina towelli types were much more robust having body diameters of 40 and 36 times in their respective lengths (holotype - 122mm; paratype - 73mm).

Loveridge did not consider that his specimens could be juvenile Typhlina diversa. This would explain their truncate appearance when compared with the adult Typhlina diversa type. Included in a series of Typhlina diversa collected on my behalf was one juvenile. This specimen measured 101mm in total length and 2.3mm in body diameter. This calculates at body diameter contained approximately 43 times in total length, a ratio similar to that of the type of Typhlina towelli. A further 11 adult specimens presented a range of between 54-70 for body diameter included in length. (figure 1).

(Figure 1) Graph (Showing the variability of the diameter to total body length ratio).



Most other morphological features outlined in the type description of Typhlina towelli conform well with those of Typhlina diversa. The only notable difference between the two species is the colouration. Both the Typhlina towelli types are a rich dark brown above with a darker centre to each scale resulting in a longitudinally aligned series of lines. The ventral surface is sharply contrasting white. Little reference to a detailed colour description of Typhlina diversa could be located, other than, brown or blackish brown above whitish below (Cogger, 1975). Four live specimens of Typhlina diversa that I examined are of the following colour. The dorsum is pale to medium brown with a darker centre to each scale resulting in a series of longitudinal lines. The ventral surface is not pure white, but creamish, most distinctive in juveniles and sub-adults. It is of interest to note that the condition of the dorsal lines may often be obscure in adult specimens but are most conspicuous in juveniles.

#### DISCUSSION

It is proposed that the findings of this report are insufficient to constitute a major change in the present status of Typhlina towelli. All Typhlina diversa specimens examined in this work are from northern arid zone areas (Renner Springs 18°19'S, 133°48'E and Tennant Creek 19°39'S, 134°11'E). Specimens from the monsoon coastal zone were unfortunately not available and the possibility of a darker colour variant could not be investigated. Further investigation should be directed at a comparison of Typhlina broomi and Typhlina towelli and an examination of far North Australian Typhlina diversa. As is indicated by the table the distinguishing feature of Typhlina towelli (Body length to diameter ratio) is inconsistent and the species may now be separated from Typhlina diversa only by colouration.

#### MATERIAL EXAMINED

Typhlina diversa - Central Australian Museum, Alice Springs. (CAM)  
R421-9, 433, 442-3, 446.

Typhlina towelli - MCZ - 48844-5

#### ACKNOWLEDGEMENTS

I am particularly grateful to Mrs. G. Lowe who kindly collected specimens on my behalf. I am further grateful to B.L. Bolton, H.G. Cogger and K.A. Johnson for their manuscript comments. The types of Typhlina towelli were examined through the courtesy of the Museum of Comparative Zoology.

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Gow, G.F., Snakes of Australia, Angus and Robertson, 1976.

Worrell, E., Reptiles of Australia, Angus and Robertson, 1963.

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## The eggs, Incubation and Young of the Bearded Dragon Amphibolurus vitticeps Ahl.

By Greg R. Johnston  
16 McEwin Street, Whyalla Playford, Sth.Aust. 5600

### INTRODUCTION

On the tenth of November 1976 two gravid Bearded Dragons were collected in an area behind the Whyalla Institute of Technology. This area is composed basically of open Acacia sowdenii woodland, associated with numerous low shrubs belonging mainly to the genus Atriplex. The coordinates of this area are 33°03'S latitude and 137°E 34'E Longitude.

One of the dragons was placed in a half tank and provided with about 15 centimetres of sand. The other was released in a small, outside pit.

### DEPOSITION

On the twenty-fourth of November the lizard in the tank was found to have laid sixteen leathery-shelled, white eggs. The eggs were found touching the bottom and one side of the tank - clearly not enough sand was present. The specimen in the pit dug a burrow and laid eleven eggs on the twenty-seventh of November.

The major portion of this excavation lay in a south-easterly direction for 35 centimetres after which it abruptly turned to the east for a distance of 15 centimetres, the deflection being about 45 degrees. The bend began at a depth of about 20 cm., and the end of the burrow was a further 5 centimetres below ground level. At the end of the burrow the width extended from the usual 8 centimetres to about 10 centimetres, the height also increased. This expanded area is believed to constitute an egg chamber. Figure 1 shows the dorsal and lateral aspects of the burrow.

The eggs measured between 23 and 29 millimetres in length and between 17 and 18 millimetres in width.

After laying, both females were found to have soil caked over the top of the snout and ventral surfaces of the hind feet. From this and published observations referring to Amphibolurus barbatus (Smith, 1974), it has been assumed that the hind legs are used to fill the burrow, while the

been assumed that the hind legs are used to fill the burrow, while the snout is used as a battering ram - to pack the soil firmly into the excavation. After the burrow had been filled, the disturbed soil around the nest was worked over until it was almost indistinguishable from the undisturbed soil surrounding the site. The tail is apparently used in this exercise as both females had soil caked over the ventral surface of this appendage.

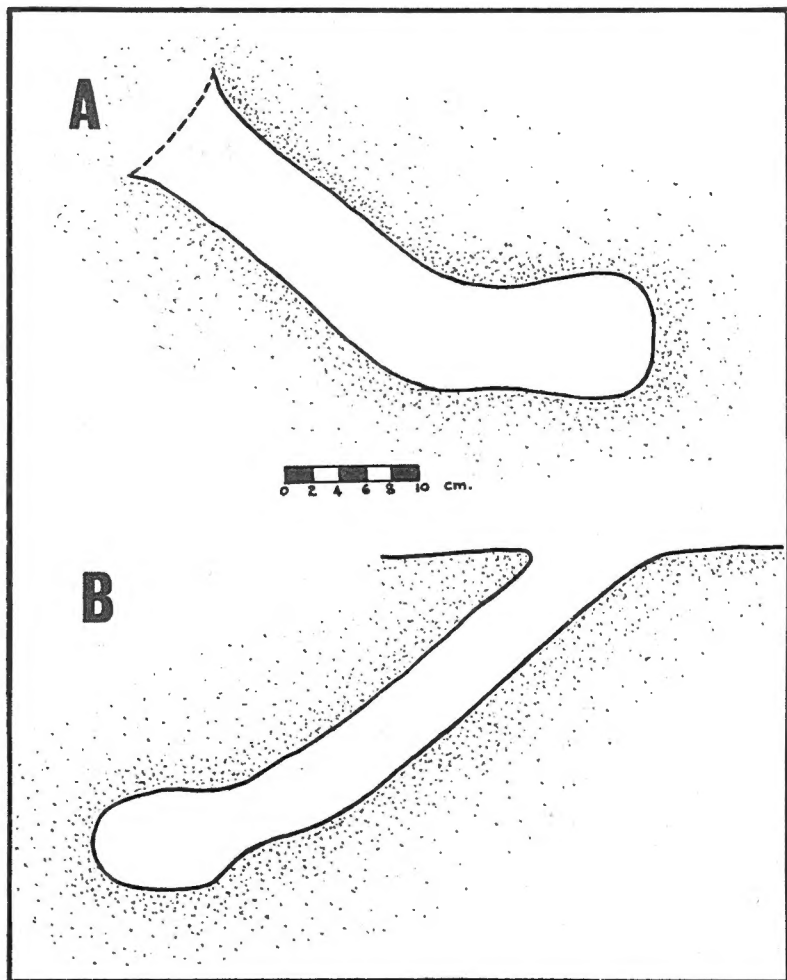


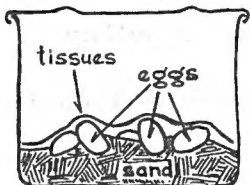
FIG. 1: A: Dorsal aspect of burrow used for egg deposition by Amphibolurus vitticeps; B: Lateral view of burrow used for egg deposition by Amphibolurus vitticeps.



## INCUBATION

In an attempt to hatch the sixteen eggs from the tank a quantity of unsterilized sand was placed in three plastic ice-cream containers. This was dampened and the eggs were placed right way up in three groups of five, five and six. Before removal from the original nest each egg was marked with a felt pen. Two wet tissues were placed over each batch of eggs and the containers were then sealed.

Fig. 2: The method used by the author to incubate eggs of Amphibolurus vitticeps.



The containers were placed next to a freezer motor, where the temperature was about 26 degrees celsius. They were checked once a week and when necessary redampened. One of the eggs developed a mould and was removed, while four others were found in a rather dehydrated state. Three of these were placed in methylated spirits and the other was discarded.

Hatching commenced on the 20th of February 1977 and continued for exactly one week. The first indication was the appearance of longitudinal slits in the eggs, from which oozed a thick, clear liquid. The head then emerged but activity ceased at this point. This posi-

tion was held in some cases for up to several hours. When the dragon commenced to emerge fully it would do so within a minute or two. Eleven out of sixteen eggs hatched successfully - a success rate of 68.75% for the method of incubation described.

## JUVENILES

The newly hatched agamids accepted small, black ants, mealworms and dead flies.

The heads and appendages of the juveniles are relatively longer than in adults; Snout-vent lengths range from 39 to 42 (mean 38) millimetres with the maximum tail length being 53 millimetres. The enlarged spinose scales and rows of same that are so prominent about the occipital region of the adults are vastly reduced in the hatchlings. The scales of the parietal area are enlarged and situated on a prominent hump. Preanal and femoral pores average 11, varying between 9 and 14. As with other species of the Amphibolurus barbatus group, colouration is much richer in immature specimens.

## DISCUSSION

After excavating a Moloch horridus burrow and finding a bend similar to the one described here for Amphibolurus vitticeps, Hudson (1977) states, "The bend.....could have been caused by a hard section of soil being present." I believe this explanation to be incorrect and feel that the bend may be a defence mechanism. A predator digging along the direction of the burrow's first section (in this case south-east) might expect to find the eggs directly ahead, but the eggs would be hidden safely to the left.

#### ACKNOWLEDGEMENTS

I wish to record my thanks to Master S. Heron and Mrs. P. Greig for their assistance, and Dr. T.F. Houston for his criticism of the manuscript.

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- Smith, J. (1974) Hatching Bearded Dragon eggs, Sth. Aust. Herp., 2(1):10

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## **Notes on the Green Tree Gecko Naultinus elegans including Captive Breeding Records.**

by R.P.V. Rowlands, 6 Tobruk Crescent, Milford, Auckland 9, N.Z.

#### DESCRIPTION

A fairly small and lightly-built gecko; average snout vent length 70mm. This gecko is predominantly green in colour, varying considerably from a pale lime green to deep emerald. Some specimens are marked with white or yellow, these markings being very variable in figuration and intensity, even within localised populations. Yellow and part-yellow specimens also occur. Colours are static i.e. this species has no ability to change colour.

#### HABITS

An arboreal and diurnal species. Most activity appears to occur late in the day; activity ceases with the onset of darkness. These geckos normally remain in the branches of trees and shrubs day and night, but will descend to the ground to take shelter in wet, windy or cold weather. In cold areas, hibernation may take place during the winter months; in the Auckland area, hibernation is incomplete and consists of quiescent periods broken by periods of limited activity in spells of mild weather.

#### RANGE

Found throughout the North Island of New Zealand, and on some offshore islands.

#### HOUSING IN CAPTIVITY

These geckos have thrived in cages of around 60cm X 60cm X 60cm, placed in the open and having plenty of wire mesh for ventilation. The cages are placed so that the geckos can receive some sunlight through the wire mesh. Geckos of this species kept away from natural sunlight, or receiving sunlight only through glass for prolonged periods, tend to suffer colour fading and a general loss of vitality. Cages are furnished with the geckos' arboreal habits in mind; growing plants in pots are used extensively.

### FEEDING

These geckos have done well on a basic diet of flies, obtained by the use of meat-baited flytraps. Moths are also fed to them when available. Other insects fed occasionally to vary the diet are Cabbage White butterflies and their larvae, small cicadas and leafhoppers. Young geckos are fed on fruit flies (Drosophila). Honey and water or fruit juice is also accepted. Fresh water is provided but is rarely taken from a dish, although these geckos will readily lick water sprayed on foliage in the cage.

### BREEDING IN CAPTIVITY

Naultinus elegans is an ovoviparous species. Mating takes place in October or November, and males will often fight for mating rights during this period, although normally tolerating each other's presence outside these months. Births occur over a widely variable period encompassing the winter months. Two offspring are normally produced, but occasionally triplets may occur.

Birth dates recorded in captivity are as follows: 30th July 1977, 12th September 1977, 26th September 1977, 30th July 1978, 22nd August 1978, and 24th April 1979.

The young geckos are placed in a separate cage directly after birth, and provided with fruit flies, honey and water or fruit juice. Larger flies are provided when available in the spring, and when the geckos are about six months old, the fruit flies are discontinued.

### GENERAL COMMENTS

This gecko is fairly common throughout its range, and is the species most commonly kept by amateur herpetologists in New Zealand (West 1978). It seems to have a more delicate constitution than other (Hoplodactylus) species, and both birth and survival rates in captivity are somewhat lower. Its apparent requirement for natural sunlight makes it an unsuitable species for keeping indoors. Young geckos of this species seem to require an abundant food supply from birth to have a fair chance of survival, and will feed at surprisingly low temperatures. However, with attention to these details it is possible to achieve a survival rate of around 70% in captive-born specimens.

### REFERENCE

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### REPRODUCTION IN KING BROWN SNAKES AND BLACK SNAKES

Dr. Richard Shine (Zoology Dept. University of Sydney, NSW 2006) would like to hear from anyone who has information on reproduction in King Brown Snakes, Spotted Black Snakes, or Red-Bellied Black Snakes, to assist his studies on reproduction in the genus Pseudechis. He is particularly anxious to determine if the King Brown Snake is an egg-layer throughout its geographic range, and would be grateful for any help. Please write to him at the above address.

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## Two Additional Sea Snake Species from South Queensland.

by Colin J. Limpus and Barry J. Lyon, National Parks & Wildlife Service,  
Northern Regional Centre, Pallarenda, Qld. 4810.

Twelve species of sea snakes have been recorded previously from subtropical Queensland waters (Limpus, 1975). In December 1976, one specimen of each of two additional species was collected from beaches near Bundaberg.

Hydrophis ornatus (Gray): Collected 29th December 1976, as beach-washed specimen on evening high tide, Wreck Rock beach (151°58'E 24°20'S), SVL\* = 108.0cm, TL\*\* = 120.0cm, female, not gravid, stomach content nil, poor condition.

Hydrophis gracilis (Shaw): Collected 20th December 1976 as beach-washed specimen on evening high tide, Mon Repos beach (152°27'E, 24°48'S), SVL\* = 84.7cm, TL\*\* = 95.0cm, female, gravid, stomach content nil, good condition. Two of the three uterine eggs contained small embryos (SVL = 5.6 and 6.0cm, TL = 6.5 and 7.3cm, with 5 and 3 trunk coils respectively). For both embryos, body organs were well defined, body pigmentation was absent, hemipenes were visible at the base of each tail, the digestive tract was not encased by the ventral body wall and no scale was visible. These embryos were comparable to Stages 29 and 30 described by Zehr (1962) for embryos of the viviparous Thamnophis sirtalis (Colubridae). The third egg was infertile.

Although H. ornatus was recorded as common in the Burnett River, Bundaberg, by Gray (1930) (as "H. ocellata (Gray)"), it was not represented among approximately 200 sea snakes collected from the Bundaberg coast and Burnett River during 5 years from 1968 (Limpus, 1975). Heatwole (1975) does not record the species from reefs of the southern Coral Sea, while it comprised only 2% of the sea snake sample examined from the Townsville area (Dunson, 1975). An isolated specimen has been recorded from each of the central New South Wales coast and Tasmania (Cogger, 1975). The species probably occurs only as vagrant individuals in eastern Australian waters.

H. gracilis was not recorded off Townsville (Dunson, 1975) and, of the reefs of the southern and coral sea, it was occasionally observed on Saumarez reef only (Heatwole, 1975). Although not previously collected from sub-tropical Queensland, the occurrence of this gravid female in good condition at Bundaberg suggests that the reproductive range of this species may extend into sub-tropical waters.

Of the 32 species of sea snakes (hydrophiidae) recorded from Australian waters, 14 species have now been recorded from sub-tropical Queensland seas. Five of these species (Aipysurus eydouxii (Gray), A. laevis Lacepede, Astrotia stokesii (Gray), Hydrophis elegans (Gray) and Disteira major (Shaw) breed within these temperate waters. The breeding distribution of Aipysurus duboisii Bavay, D. kingii (Boulenger), H. gracilis,

H. ornatus and Lapemis hardwickii Gray may extend marginally into sub-tropical waters. Emydocephalus annulatus Krefft, Acalyptophis peronii (Dumeril), Enhydrina schistosa (Daudin) and Pelamis platurus (Linnaeus) may best be regarded as vagrants, probably drifting on currents from the north.

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## On the Birth and Breeding of Death Adders in Captivity.

by Peter Hudson, 13 James Street, Whyalla Norrie, S.A. 5608

In Whyalla there has been some measure of success in the captive breeding of the Death Adder, Acanthophis antarcticus (Shaw) To date there have been four such occasions:

- (1) 10th March, 1976.....24 live young, 8 dead on birth
- (2) 20th March, 1976.....19 live young, 2 dead on birth
- (3) 13th March, 1977..... 10 dead on birth
- (4) 10th March, 1979.....10 live young, 14 dead on birth

Peter Mirtschin (1976) has written notes on the breeding of Death Adders in captivity, and there is also a cine-film record of an actual birth. The following data hopefully adds to the information available.

The Death Adders involved in the first three instances were kept by Peter Mirtschin, and both males and females were collected from the Iron

Duke region (33° 23'S, 137° 10'E) or nearby. The female in birth 4 was collected from Port Germein (33° 01'S, 138° 00'E) on 1st April, 1976. The male was collected from Tumby Bay (34° 23'S, 136° 05'E) on 1st June 1976. Both snakes were retained by Hans van Dyke and transferred to the Whyalla Fauna Park on 24th October 1976. These two Death Adders have the drab colouration typical of those from coastal regions.

The two snakes were on public display and were observed mating on a number of occasions by members of the Western Herpetology Group. The recorded instances were: 15th October 1977, 19th August 1978 and 15/16th October 1978. The female shed on 3rd October 1978 and was last fed on 17th October 1978 when she took 1 mouse. Because of her great girth the female was suspected of having been gravid for some time. The male was removed from public display on the 16th December 1978, and on 27th January, 1979 the female was also removed and placed in an off-show cage. On the 28th February 1979, she was found to be infested with mite which was treated by placing a portion of pest strip in the cage. This was left there until after the births.

Beside her great girth the female adopted a quite distinct body posture, which was also observed in the females involved in the other births. Instead of the body being in tight bends with the tail beside the head they lay with the body forming a very flattened crescent, the tail being quite distant from the head. It was also noticed that, for some weeks prior to birth, the female was restless.

At approximately 11.30 on the morning of Saturday 10th March 1979, the female was discovered to have given birth. An account of the juveniles is as follows:

- a) 10 live, two having deformities thought to be of the vertebrae.
- b) 14 dead, either on birth or within 30 minutes. Two were runts and of the remaining twelve, seven had similar deformities of the vertebrae. One of these also had a deformed skull. There were also another two with deformed skulls.
- c) Along with the snakes listed above there were thirteen creamy coloured masses which were thought to be unfertilised eggs.

When discovered, only a few of the young had pierced the soft egg encasing them, consequently the remainder were assisted, a procedure which had been adopted for previous births. Such a high mortality rate is distressing and one needs to look into its cause. It was suggested by Harry Ehmann that one factor could be that the females were held at high cage temperatures during gestation. Hopefully the problem relates only to temperatures and, if so, provision can be made in future breeding attempts.

The ten surviving juveniles were weighed by 2.30 p.m. that day. Each Snake was numbered and a list of distinguishing features made. The features used were the irregularities in the banding and this will facilitate future identification for a project on growth.

<u>SPECIMEN</u>	<u>WEIGHT</u>	<u>WEIGHT</u>
<u>NUMBER</u>	<u>10th MARCH 1979</u>	<u>10th JUNE 1979</u>
1	5.32gms	14.54gms
2	5.18	11.16

3	5.02	12.11
4	4.39	12.55
5	5.38	11.28
6	4.89	9.48
7	4.47	12.53
8	4.48	8.27
9	5.43	DIED
10	5.98	4.71

The following information has been recorded from ten of the dead snakes:

<u>TOTAL LENGTH</u>	<u>VENTRALS</u>	<u>SUBCAUDALS</u>	<u>MIDBODY</u>
139mm	123	43	21
132	126	42	21
108	118	46	21 male
110	114	44	21 male
125	122	43	21
112	122	43	21
103	123	42	21
120	114	38	21
121	118	42	21
93	122	42	21

#### ACKNOWLEDGEMENTS

For his criticisms and information supplied I am indebted to Peter Mirtschin. Thanks are also due to Clint Garrett and John Saint for their assistance in having the juveniles weighed.

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## THE ROAD TO MOKARI.

by Julian White, 4 Elderslie Ave., S.A. 5082

Every Easter, the South Australian Herpetology Group Inc. mounts a major herp trip to some remote and poorly surveyed part of South Australia and Easter 1979 was no exception. The official dates for the trip were the 11th to 21st of April, but most members came for only part of that time.

The first area visited by the group was Anna Creek Station, which lies just west of William Creek, to the west of Lake Eyre. The group's advance party set up pit-trap lines in the dunes near the homestead, and camp was made at the foot of the dunes. Anna Creek is a typical arid lands pastoral station, and the level of destruction of natural habitat by cattle is no worse there than elsewhere. Inevitably, much of the habitat is severely altered, with most low ground cover being destroyed, and many potential reptile niches obliterated. The effects of rabbits are incalculable, but in this habitat are probably more detrimental than cattle to the reptile population. Even the dunes, which are about 20-30 metres high, are affected. The main dune vegetation is canegrass, which is abundant. Although many lizard tracks were seen, few species were found, and no unusual species were sighted. Apart from some excitement

catching a Western Brown Snake (Pseudonaja nuchalis) at the homestead, Anna Creek proved uninteresting to the group. If we had time to visit areas further from the main station, and still relatively untouched by stock, we might have found a different picture, as this area should contain a wide range of reptiles. Even our pit-traps were unsuccessful, only two species being recovered from the lines. Table I summarises reptiles seen or collected from Anna Creek region.

While at Anna Creek, we visited the western side of Lake Eyre. In contrast to those parts of eastern Lake Eyre I have visited and which are sandy, the western side was almost a nightmare or moon landscape. The glaring white salt crust of the Lake was ringed by low gibber hills and gibber plain, with almost no plants of any description evident except in the small sandy patches. Numbers of low gibber spits rimmed the Lake margins, extending some distance onto the salt crust. These were carefully searched for Lake Eyre dragons (Amphibolurus maculosus), which to the best of my knowledge, have not been captured since the Lake flooded in 1974. Numerous holes, typical of A. maculosus were seen, and excavated but although many looked recent, none were found. Earless dragons (Tympanocryptis intima), were found on the gibber, and even out on the Lake crust. Painted dragons (A. pictus) were found in sandy areas on the Lake edge, and a Bynoe's gecko (Heteronotia binoei) was found under a large rock at the lake's edge. Apart from a Morethia adelaidensis, no other species were seen in the Lake Eyre region.

From Lake Eyre, those members who had more than the four days of Easter available, moved north towards Oodnadatta, a railway town in the far north of S.A. Our intention was to visit the Everard Ranges, in the northwest of the State, but when we reached Oodnadatta we were persuaded to change our minds. Recent rains had made the roads from Oodnadatta to the Everards almost impassable and there had been a murder at a station next to Everard Park which could have made permission to enter the area difficult. But the Oodnadatta residents came to our rescue by telling us about a very interesting road from Oodnadatta, which went into the Simpson Desert via Macumba Station. The road had been made several years ago for a French mining company and ended some distance inside the Simpson, at a place called Mokari. From Mokari the road allegedly continues all the way to Birdsville although we only went as far as Mokari, a distance of 240km.

The first section of road, to Macumba, is through low undulating gibber desert but we didn't have time to search this area. From Macumba, the road weaves through more gibber and a region of thickly vegetated plain, reminiscent of the N.T., before emerging in a wide gibber swale, between two huge long red sand dunes over 40 metres high. These are the southern edge of the Simpson, and are covered in canegrass and spinifex. Although we had little time to search the area Netted dragons (A. inermis) were extracted from burrows in the swales, and Ctenotus were active on the dunes. A skink similar to Sphenomorphus richardsoni was seen on a dune top at night but eluded capture, which was very disappointing as it lacked any banding.

From this region we moved on through a very long stretch of gibber plain interspersed with numerous creek beds and low gibber strewn hills. This was by far the worst stretch of road for the vehicles but very interesting for reptiles. Among the reptiles seen (Table III) were two Perenties (Varanus giganteus), one being over 1.5 metres long which allowed us Page 14



to stand next to it. The most interesting find in this region was the Red-Barred dragon (*A. vadrappa*), a rock dragon previously thought to be limited to the Flinders Ranges. Three pairs of this beautiful lizard were found, mostly active, despite the cool weather. All were found on the mid to lower slopes of gibber strewn hills, well away from the larger rock outcrops near the top of the hills. All appeared to have a much more robust and less vertically depressed skull than the Flinders Ranges *A. vadrappa*. Male colouration was slightly different, and the females were quite different from their southern cousins. I suspect that these *A. vadrappa* from the gibber west of the Simpson, are a distinct subspecies. Certainly our find has greatly extended the known range of the Red-Barred dragon.

After leaving the gibber the road moved into the low dunes at the western edge of the Simpson. From here on the road was approximately east-west, going up and down over countless red sand dunes, 20-40 metres or more in height. Most dunes had a heavy vegetation cover with canegrass and spinifex predominating in most areas. The spinifex was dominant on the western slopes and swales, and the canegrass dominated the eastern slopes. Two camps were made in the desert, the first at Purni Bore where a pit-trap line was laid and the second at Mokari. Reptiles seen in the desert are shown in Table IV. Most common were the Desert skinks (*Egernia inornata*), a number of which were stomach flushed, with limited success. They seemed to be eating mainly ants, especially *Iridomyrmex* sp. (tentative identification only) and small beetles. Although exact measurements were not taken, it was my impression that *E. inornata* burrow densities around Mokari were considerably greater than those reported by Webber (1979). No startling reptile finds were made in the Simpson Desert, but time did not permit a comprehensive survey. The only really unusual reptile found at Mokari was a small skink which could possibly be a new species.

TABLE I

Reptiles recorded in the vicinity  
of Anna Creek.

<u>Amphibolurus pictus</u>	Painted dragon
<u>Tympanocryptis intima</u>	Earless dragon
<u>Ctenotus brooksii</u>	Striped skink
<u>Ctenotus regius</u>	Striped skink
<u>Lerista labialis</u>	Burrowing skink
<u>Diplodactylus tessalatus</u>	Tessalated gecko
<u>Gehyra variegata</u>	Dtella
<u>Heteronotia binoei</u>	Bynoes gecko
<u>Lucasium damaeum</u>	Beaded gecko
<u>Varanus gouldii</u>	Gould's goanna
<u>Pseudonaja nuchalis</u>	Western brown snake

TABLE II

Reptiles recorded on Anna Creek

<u>Lophognathus longirostris</u>	Long -snouted dragon
<u>Tympanocryptis intima</u>	Earless dragon
<u>Egernia stokesii</u>	Stoke's skink
<u>Lerista muelleri</u>	Burrowing skink
<u>Lucasium damaeum</u>	Beaded gecko

TABLE III

Reptiles recorded from gibber north  
of Oodnadatta.

<u>Amphibolurus pictus</u>	Painted dragon
<u>Amphibolurus vadrappa</u>	Red-Barred dragon
<u>Tympanocryptis intima</u>	Earless dragon
<u>Ctenotus brooksii</u>	Striped skink
<u>Gehyra variegata</u>	Dtella
<u>Heteronotia binoeii</u>	Bynoes gecko
<u>Varanus giganteus</u>	Perentie

TABLE IV

Reptiles recorded from Simpson  
Desert-Mokari.

<u>Amphibolurus vitticeps</u>	Bearded dragon
<u>Ctenotus brooksii</u>	Striped skink
<u>Ctenotus regius</u>	Striped skink
<u>Egernia inornata</u>	Desert skink
<u>Lerista labialis</u>	Burrowing skink
<u>Nephruerus laevis</u>	Knob-tailed gecko
<u>Varanus eremius</u>	Fyggy goanna (tracks only)
<u>Varanus gouldii</u>	Gould's goanna

## ACKNOWLEDGEMENTS

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## Notes on the Gecko Heteropholis stellatus.

by P.J. Mainwaring, 7 Chichester Drive, Silverstream, Wellington, N.Z.

## INTRODUCTION

This gecko, which Sharell (1966) named the 'Star Spangled Gecko' is one of the most beautiful species of New Zealand green tree gecko.

The species occurs as four localised variations which to date have not been scientifically subclassified. Within this article the four types will be referred to as Nelson Lakes, Maitai Valley, Sandy Bay and Lewis Pass. These are the common names presently in use and refer to the locality from which each type originates. The four localities are all within 160 square kilometres in the northern part of NZ's South Island (Lat. 41° to 43° Long. 172° to 173°50'). H. stellatus is one of five Heteropholids endemic to the South Island.

## DESCRIPTION

As each variety within itself comprises such an array of patterned markings and colour combinations, they defy an accurate general description. Most specimens have differing shades of green, with brown markings intermingled with any combination of silver, yellow, black or brown additional colouration. The Lewis Pass variety is the only one which is consistently coloured, being an overall olive green with black, brown and yellow flecked markings.

There is no difference in size between sexes within each variety. A medium to large sized *Heteropholis*, the Nelson Lakes and Lewis Pass as adults average 75mm snout-vent length and have a fairly solid build, whereas the Maitai and Sandy Bay average a snout-vent length of only 65-70mm and are rather lightly built by comparison.

The young of all four types are born dark green in colour with longitudinal rows of star shaped markings down the back and tail with two crescent shaped markings on the head. They remain this way until about six months of age when the adult colouration starts to emerge. Many adults retain the star shaped markings. Colour change amongst New Zealand geckos is a point of contention. In the author's experience no *H. stellatus* actually change colour, although Nelson Lakes specimens can change their shade of colour, with temperature variation. Even so, this is not uniform within the variety.

## BEHAVIOUR

These geckos are usually agreeable within a captive colony of their own kind, although territoriality becomes pronounced during mating season, when males show aggression towards one another. This can become a problem if caging is too restrictive. As in other New Zealand species of gecko, tail regeneration occurs, but never to the original length and without the original pattern.

Skin sloughing takes place as regularly as every four weeks during the summer but less often in the winter.

During winter (May-August) these geckos hibernate, although only partially. They will emerge and bask in the sun on a fine winter's day but are unlikely to accept food even if it is available.

## TERRARIA

In the author's terraria every attempt is made to recreate the natural habitat of these geckos. Cage size is dependent on the number of specimens to be housed together, but 28 cubic decimetres per gecko would be more than adequate. Each cage has an aluminium plant trough sunk into the asbestos floor, which is planted with shrubs suitable for geckos to climb upon, such as manuka (*Leptospermum* sp.) or *Coprosma* sp. Solid branches are provided as well as pieces of bark and sphagnum moss for the geckos to hide and hibernate under.

Care is taken not to over moisten the cage as most geckos will not tolerate damp conditions. Cages are situated outside in an open position facing west to take advantage of the sun in all seasons.

## DIET

In captivity *H. stellatus* are fed live flies and moths; however they do show a marked preference for moths and appreciate variety to their diet, such as leafhoppers and whatever other winged insects are available. To

supplement their captive diet, they are occasionally provided with banana, honey diluted with water, baby's fruit gel and ostomalt, providing vitamins and minerals which might otherwise be lacking. Drinking water is available though all geckos prefer licking dew off foliage and their cage plants are often sprayed with water for this reason.

#### BREEDING

In the author's collection, mating has been observed during August and September (Spring) with offspring subsequently being born during April and May (early Winter). This suggests a gestation period of approximately eight months. The varieties vary slightly with the Sandy Bay type giving birth earliest, normally from March onwards, a month earlier than the other three varieties.

H. stellatus are ovoviviparous as are all endemic New Zealand geckos; twins are born although single births occasionally occur. Before giving birth the females become very restless, spending time on the cage floor. This is always a good indication of impending birth.

The birth season is late Autumn-early Winter when the weather begins to deteriorate; however the females have an uncanny knack of selecting good weather conditions for giving birth. Females have been known to give birth to one offspring and delay the other for up to a week.

The young geckos are wintered indoors where the temperature is kinder, although artificial heat is not provided. They are raised on cultured fruit flies (Drosophila) until Spring by which time they have grown sufficiently to accept larger food. Their growth rate speeds up remarkably as soon as small moths are introduced into their diet at the beginning of Spring.

The survival rate of captive born young and the species in general has been particularly good in the author's collection, whereas herpetologists in northern parts of New Zealand have had great difficulty in maintaining H. stellatus and have seldom bred them. Obviously this is a climatic problem and it is difficult to suggest how this might be overcome.

The Lewis Pass variety has rarely been bred in captivity. This is in contrast to the Sandy Bay, Maitai and Nelson Lakes varieties which breed freely given correct conditions. Perhaps the high altitude at which the Lewis Pass gecko lives in its wild state is a factor in making this a difficult captive species.

#### GENERAL

It is difficult to ascertain the lifespan of H. stellatus as there are not a great number of captive specimens from which to take an accurate survey. Well maintained captive specimens are generally considered to live longer than their wild counterparts. The author has two Lakes 'Stellatus' which are at least ten years old, tending to suggest that the life span could be considerably greater. There is still relatively little known or recorded about H. stellatus. Hopefully at some time in the near future the four variations of the beautiful 'Star Spangled Gecko' will be separately subclassified.

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## A Large Aggregation of Skink Eggs.

by R. Wells, P.O.Box 83, Blacktown, NSW 2148

On the 11th March, 1979 a scincid communal egg-site containing 497 eggs (all except one had hatched) was uncovered at Castlereagh N.S.W. (Lat. 33°45'S. Long. 150°47'E.). It would appear probable that one or more species of Lampropholis skink was responsible for the aggregation, since the only communal-laying lizards so far found in this area are L. delicata and L. guichenoti (L. mustelina may also occur here). Further, extreme juveniles (i.e. recently hatched) of both L. delicata (10) and L. guichenoti (1) were found within 2 metres of the egg-site, and adults of L. delicata were commonly observed in the general area. The unhatched egg eventually hatched to L. guichenoti on the 24th March 1979. This does not immediately imply that this species was solely responsible for the entire aggregation, for Wells (1979) has reported an instance where both L. delicata and L. guichenoti utilised one site simultaneously for communal laying purposes.

### DESCRIPTION OF HABITAT AND EGG-SITE

The egg deposition site was situated at the edge of dry sclerophyll forest (Eucalyptus maculata and E. racemosa appeared to be dominant) and Banksia heath association. Surface cover consisted of continuous tussock grass with occasional patches of sword grass; leaf litter was also dense in places. The soil was quite fine, almost sandy. An extensively cleared area (Drag racing strip) was present to the immediate west of the site. Nearby forest areas had been severely disturbed by bulldozing activities as well as fire, and regeneration appeared to be limited to low heath. Few trees exceeded 2 metres in height, indicating that the disturbance was fairly recent. There had also been a noticeable loss of the fine sandy substrate, leaving the (previously) underlying clay and laterite pebbles exposed.

Although the communal site was more or less on the western aspect of the undisturbed section of forest, precise solar advantage of the position could not be determined since it received nearly continual direct daily exposure. The eggs were discovered on fine sandy soil beneath a stack of corrugated iron contained within an area of about one square metre. However, the aggregation was divisible into four distinct peripherally positioned (at edge of iron cover) masses along with six other smaller groups which had been deposited between the masses. (See figure 1). The composition of the masses was as follows: mass A-56 (including one unhatched), B-220, C-160, D-46. The six smaller groups totalling 15 eggs distributed as 1,2,2,3,3,4.

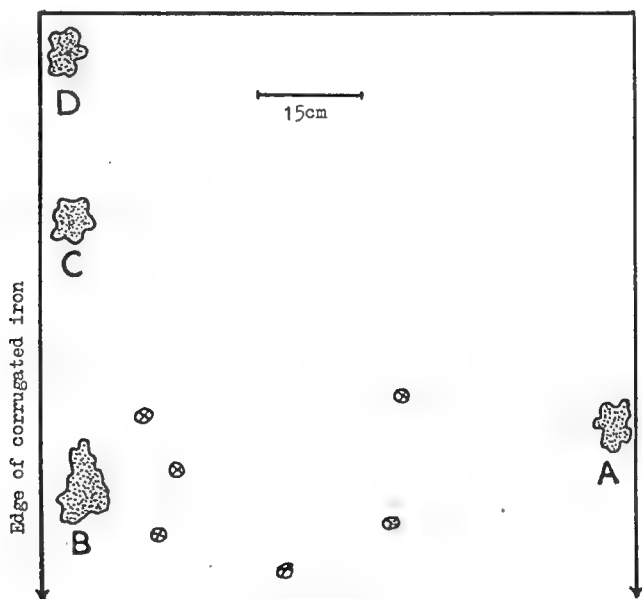
The existence of 4 distinct masses suggests up to four seasons' layings, since the egg numbers of the individual masses are comparable to isolated single season aggregations for any of the above mentioned Lampropholis skinks. However, it is considered highly probable that the majority were the result of a single seasons laying and that hatching had taken place quite recently. The uniform white and flexible nature of 472 egg cases gave the immediate impression that they were laid about the same time. Repeated useage of a favoured site results in distinct grades of deterioration in the egg cases - a further 24 egg cases showed such deterioration (orange-brown and considerably reduced by dehydration)

ion). The 24 were positioned partly beneath masses A and D, and a shallow (1-5mm) covering of soil; it is considered likely that these were from a previous season to that which produced the other 472. Enquiries to the raceway management (Mr. Bruce Lynch) further supports that the aggregation was largely the result of a single season's laying, since the overlying corrugated iron had been placed at the site "less than 18 months ago."

Should the bulk of this aggregation have been produced in one season, as appears likely, then an approximation of the number of contributing females would be between 120-240 for L. delicata and L. guichenoti, the two most logical contenders. (Clutch size 2-4)

Such a high number of gravid females concentrated at one site would appear unusual but not unrealistic. However, the possibility of forced recruitment of specimens from the disturbed forest some 150 metres distant might also be worth considering.

figure 1



#### ACKNOWLEDGEMENTS

Thanks are due to Mr. Glen Laycock who assisted in the examination of the site, and to Mr. Bruce Lynch for permission to collect in the area as well as for information.

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## Incubation of Sand Goanna (Varanus gouldii) Eggs.

by Brian Barnett, 16 Suspension St., Ardeer, Vic. 3022.

Late in 1978 I received a phone call from a fellow Victorian Herpetological Society member with a Sand Goanna in his collection that had just deposited eggs. As he had no previous experience in incubating reptile eggs I was asked to take charge of them. I agreed but suggested that to gain experience he should retain some and eventually I took five eggs and he kept three. Although our methods of incubation were similar there was a considerable difference in hatching times. His eggs were kept in a container in a snake cage and mine were in similar containers in my incubator, which is on thermostat with a temperature range of 30-32°C. His cage temperatures were slightly lower. The incubator I use for all eggs is kept at this temperature and is constructed from chipboard with a hinged front. The only ventilation is from a 8cm X 15cm vent in the front door. Measurements are 90cm long X 60cm high X 50cm wide, and heat is provided by four 25 watt globes in the roof.

The medium used for these eggs and most eggs in the past has been peat moss but, due to several eggs being lost through fungus in the last incubating season, I have decided to change over to Vermiculite in future. The eggs were examined every second day and a fine spray of water given if thought necessary.

The eggs were deposited on the 29th November 1978 in an 18½ hour period with the last one being laid early the next day. The female was just over 60cm in length. Of the three eggs kept by the other member, two were lost in the first week. The third was kept under incubation for approximately ten weeks before it was brought over to me. It appeared to be still a healthy egg but was lacking in moisture to the extent that it was badly caved in. With very fine spraying over the next few days the egg was brought up to a presentable shape again.

I have incubated the eggs of many species of reptiles in the past, but this experience was the most trying of all. Most eggs are incubated within a 2-3 month period but these eggs just went on and on. They looked alright and there was no reason to suspect otherwise but impatience finally caught up with me after 5½ months and I opened an egg. The embryo was fully formed and apparently not far from hatching. My impatience was controlled and the three remaining eggs that I had incubated since laying finally came through. The dates of the births are those at which the young broke through the egg shell and not the date of complete emergence. Once the egg was broken the young lizard remained inside for 1-2 days.

Date of laying: 29th November 1978.

1. Opened 13th April 1979. Fully formed but did not survive.
2. Born 16th May 1979 (169 days)
3. Born 19th May 1979 (172 days)
4. Born 19th May 1979 (172 days)

Waiting for 24 weeks was bad enough but I still had one egg to go which was the surviving egg from the other member. The slight difference in heat between the two incubators was a major factor in incubating time.

5. Born 24th June 1979 (208 days)

All young were healthy when born and measured on average 26cm, the tail being 15cm. Two were retained and two given away. Crickets were offered at first but these were rejected and small skinks were offered which were readily accepted. Although the preference is still skinks a trick method was tried. Feed skinks were collected and the tails only were offered. The young monitors accepted these 'wriggling skinks' but at the same time medium sized crickets were also placed in the cage and amongst the confusion and activity crickets were also eaten. By this method one is accepting crickets now but the other still requires the trick feeding. The advantage with using tails only is that the skink itself can be saved and returned to its exact area of capture in a short time. Thus a population that would have been completely removed for feed will continue to exist.

There has been much discussion concerning the incubation of these eggs and an incubation period of almost 30 weeks leaves a lot of food for thought. A goanna in the wild would lay its eggs at approximately the same time that these were laid. As the incubation period was controlled at probably the maximum amount of heat, it is possible that the last egg was closer to the natural incubation time than the others. Taking into account the cooler nights etc I think this is feasible. As the young could not be born in the winter and survive, possibly the natural incubation period could even be longer with the young emerging in the Spring.

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## **Comments on the Reproduction of Pygopus lepidopus (Lacepede).**

by R. Wells, P.O.Box 83, Blacktown, NSW 2148  
and G. Husband, 21 Edward St., Guildford West, NSW 2161.

An egg deposition site of this species was discovered near Uki, N.S.W. at 0950 hrs (E.S.T.) on the 20th April 1976. Six eggs (4 hatched, 2 unhatched) were found beneath a large rock on stony soil on the north-east aspect of a grazed hill slope (previously sclerophyll forest) see fig 1. The eggs had been deposited in a stony depression or cavity which seemed to be the result of erosion, towards the extreme edge of the rock and 100-150mm beneath the surface; access to the cavity from the surface was not apparent, though some earth disturbance took place when the rock was initially moved. The cavity containing the eggs was quite irregular but approximate dimensions were 70mm wide at contact with rock, 100mm in depth and 80mm basal width.

The eggs were distinctly arranged as an underlying group of 4 hatched cases (dark brown and slightly dehydrated) and 2 unhatched obviously in an advanced state of development. Although we were unsure as to the identity of the eggs, it was apparent that they were from one species. The hatched eggs were from a previous season judging by their condition.

All eggs were removed from the site and placed in a plastic bag. At 1100 hrs (1hr 10 after discovery), one egg began to lose fluid through a longitudinal slit (16mm) almost as long as the egg itself and a smaller (7mm) median transverse slit (fig. 2a). It took several minutes for the



specimen to emerge completely (fig. 3). The other egg hatched at 1900hrs (E.S.T.) on 28th April 1976. Although the dimensions of the first egg were not recorded, the second egg had been measured at 37mm X 18mm about 2 hrs prior to its hatching. The second egg had a smaller (12mm) longitudinal slit (fig. 2b) from which the specimen emerged cautiously at first then, after some seconds, with a sudden almost thrashing movement.

Fig. 1



Fig. 3



Of the other four hatched egg-cases, only one could be measured with any degree of accuracy. The emergence slit was again 12mm in length, to one end of the egg. All hatched eggs had similarly placed (longitudinal and to one end) emergence slits.

The measurements of the hatchlings were as follows:

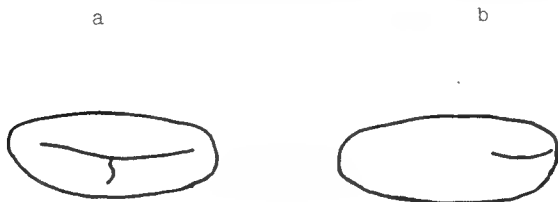
1. SV 88mm VT 127mm (total 215mm).
2. SV 85mm VT 142mm (total 227mm).

McPhee (1959) stated that this species "seldom lays more than 4 in a clutch," while Ormsby (1961) reported finding a single unhatched egg on the 14th March 1959 (Patonga Beach, N.S.W.). Ormsby's specimen hatched "on or about 17th April 1959."

We have examined all the gravid female *P. lepidopodus* in the Australian Museum Sydney (R3342, 8710, 10599, 13061, 13235, 13540, 14800, 19115), and found that all but one contained 2 eggs. The exception (R8710) contained a single egg, but it was apparent that another had been removed before our examination. The snout-vent lengths of specimens containing advanced shelled eggs ranged from 175.0mm to 210.0mm (mean 192.0mm - 8 specimens).

Should the clutch size be two as indicated by the above, the presence of the four hatched eggs could mean that this species might return to a particular egg deposition site over a number of seasons, or that more than one individual may contribute to a site. McPhee (pers. comm.) has had no personal experience with egg-laying in *P. lepidopodus* but considers it possible that more than one specimen may lay at an ideal site, since he knows an instance where a mass of 20 eggs from *Lialis burtonis* was discovered (McPhee 1979b).

Fig. 2. Nature of emergence slits on two *P. lepidopodus* eggs.  
(near Normal size)



#### ACKNOWLEDGEMENTS

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## HERPETOLOGICAL NOTES.

### TORTOISE EGG PREDATION AT LAKE BONNEY, SOUTH AUSTRALIA

by Michael B. Thompson, c/- Dept. Zoology, University of Adelaide.

During the course of field work related to the physiology of the Murray short-necked tortoise, Emydura macquarii, eggs at Lake Bonney near Barmara, S.A. I made some disturbing observations.

These tortoises lay their eggs from early November through to late December with the heaviest nesting occurring during storms in mid to late November. In 1978 there was a storm on the night of the 18th of November and the following morning. This was also the heaviest laying period during the season. By the time I reached the Lake on the afternoon of the 19th over seventy percent (8 out of 11) of the nests I saw had been destroyed by predators (presumably foxes). Earlier that morning a local resident and officers of the NPWS had been to a different part of the Lake and collected the eggs from about ten undisturbed nests. They also reported many destroyed nests.

I needed two complete undisturbed nests for my experiments. It was necessary to cover them with wire netting to avoid destruction the following night. My observations indicate that no nests are spared from destruction by predators. On nights when heavy egg laying occurs the foxes eat their fill and come back on successive nights to finish off the remaining nests. In my opinion very few, if any, eggs reach the hatching stage. This is partly supported in that I saw no small or medium sized tortoises in Lake Bonney in a two and a half month period covering many hundreds of tortoise sightings. I did not catch any of the adult tortoises for close examination and I realise that juveniles are generally cryptic in their habits but I strongly believe that there is little recruitment from reproduction. The probability of this being an aging population is high which is a very concerning situation. I have made no observations in other parts of the Murray system but considering the common occurrence of foxes in S.A. it is likely that this destruction is a widespread phenomenon. I do not know whether similar situations occur elsewhere in Australia. This note is aimed at stimulating herpetologists in other States to make observations and to act accordingly.

Of two possible solutions to this problem one is being partly implemented in South Australia. The NPWS has issued a permit to a local resident at Barmara who has considerable experience at hatching Emydura eggs, to collect 1000 eggs from Lake Bonney. The hatchlings to be released into the Lake. Unfortunately only about 400 eggs were located last season, and over 300 hatchlings were released in February, 1979.

The other solution is to erect a vermin-proof fence at well known nesting beaches. The initial cost of such an operation is high and after fencing the area would have to be properly managed and maintained. Although this solution is possibly more ecologically attractive it is expensive.

It is to be hoped that recognition of this alarming situation will prevent what could be a disaster.

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#### NOTES ON THE BEHAVIOURAL ANTICS OF THE PAINTED DRAGON

Amphibolurus pictus Peters.

by Peter Hudson, 13 James Street, Whyalla Norrie, S.A. 5608

At approximately 1.30pm on 24th March 1979 I encountered 2 male Painted Dragons in an absorbing conflict. My attention was initially drawn to them by the action of one rushing up to and biting the other. This appeared to be a token aggression as they were only momentarily engaged, the bitten animal retreating about 1.5 metres. Although the incident lasted only a short time it seemed that they were gripped mouth to mouth. The aggressor was a male in the most brilliant breeding colours with almost the whole back being bright orange-yellow. The other, whilst obviously a male, was comparatively dull.

This conflict occurred upon a rubbed track in the Whyalla Fauna Park (33° 03'S, 137° 31'E). The two lizards were observed for approximately fifteen minutes and during this time the site of the conflict shifted some 20 metres. Throughout the period of observation the incidence of biting as already described was minimal, with about five such attacks being made.

A behavioural activity in which both dragons indulged throughout the conflict was that of tail "wagging". This involved raising the tail well above the ground, waving it from side to side and at the same time "snaking" or twisting it in a motion similar to a moving snake, although more pronounced. At no time was the tail coiled as in the cover illustration of A. vadrappa on Houston's book, "Dragon Lizards and Goannas of South Australia". To accentuate this activity the lizards raised themselves to full height. At one point the two dragons were facing in the same direction, with the aggressor being hindmost, both still indulging in tail "wagging".

Toward the end of the observation the intruding dragon climbed on top of a 40cm high pile of mulch. The aggressor was situated approximately 4 to 5 metres away but, from the antics of the dragon atop the pile, it was obvious he was still being pursued as he took up a number of different positions and indulged in vigorous tail "wagging", all the time facing the aggressor.

I believe the raising of the crest or ridge upon the vertebral region between fore and hind limbs and a smaller one immediately behind the head to be a behavioural response. For the full period of observation both dragons had crests of this nature.

Although it appears that head bobbing often takes on a significant role in behavioural activities generally, these dragon lizards indulged in head bobbing that was only barely perceptible.

For their assistance in the field I am indebted to Neill Broadhead and Stephen Heron of the Western Herpetology Group.

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## NOTES ON EGG-LAYING IN CHELODINA LONGICOLLIS (SHAW)

by K.J. Kennerson, 46 Berith Road, South Wentworthville, NSW 2145

Recently the author observed an adult female Chelodina longicollis lay eggs under captive conditions. The specimen presumably mated in captivity, as it had been in the enclosure for 8 years along with five other adult specimens. A total of 11 eggs were laid during the afternoon of the 15th December, 1978 between 1630 and 1700 hours.

The female commenced digging with its hind limbs in firm grass and soil which was slightly damp after periods of rain on the 11th and 13th of December, 1978. After a few minutes the soil became quite muddy, apparently due to cloacal discharge, which would considerably reduce digging effort. The hole reached a maximum depth of approx. 75mm. After the eggs were deposited the female refilled the hole with the excavated soil by using its hind limbs and periodically "patting" the soil firmer by raising and lowering the hind portion of the body.

The eggs were not removed to allow natural incubation, but later observation during December (approx. 1 week after laying) revealed that the eggs had been destroyed by small black ants.

Goode (1967) reported that Chelodina longicollis laid 10-15 eggs (Murray River area).

Goode and Russell (1968) stated that this species' nesting period ran from the 26th November-19th December (at Patho, Victoria).

Wells, (1973) reported an instance of egg-laying in the species (12 eggs laid 12th December, 1969) and described a similar method of nest construction.

Cann (1978) reports a clutch size of 8-24.

The clutch reported, and the period of laying supports the existing literature on this reproduction.

### ACKNOWLEDGEMENTS

Thanks are due to Richard Wells for supplying the references.

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### COURTSHIP DISPLAY OF THE SNAPPING TORTOISE, ELSEYA LATISTERNUM GRAY

by Julian White, 4 Elderslie Ave., Prospect, S.A. 5082.

There have been few published observations of Australian Chelid tortoise behaviour, particularly courtship behaviour. Observations on several overseas species of aquatic tortoise have been published, including Chrysemys picta bellii, and Pseudemys scripta elegans. In this latter species, the male swims backwards slowly, in front of the female, slowly and delicately touching the females anterior head especially in the sub-mandibular region. John Cann describes a similar courtship display in an Australian tortoise, of the genus Emydura, observed in the wild state

in the Macleay River.

For some years I have observed a captive pair of Elseya latisternum from the Cairns region which live in a very large aquarium. This pair often go through their courtship routine. The male at first swims behind the female and appears to be smelling her anal region. He then moves closer and sticks his nose in the skin around the female's anus. This behaviour is continued intermittently for varying lengths of time and is occasionally so vigorous that the male actually pushes the female along. This behaviour may go on for several days. Abruptly, the male changes position and moves to the front of the female, swimming backward in front of her, his nose about 1-2 cm in front of her nose. He gently moves his front feet near her head, toes splayed out with webbing displayed, the claws pointing away from the females head. He occasionally strokes the side of her head with his feet. This display may go on for many hours, as the tortoises swim slowly around the tank, only rarely surfacing for air. The pair may continue this display for up to a week or more, then cease. I have never observed them actually mating, but as the female has produced eggs on two successive occasions I presume that successful mating occurred. Unfortunately, on both occasions the eggs were laid in the water, and were rapidly destroyed by the water, the tortoises and a crocodile in the same aquarium.

A juvenile male Elseya latisternum in a separate aquarium with a similar sized juvenile female Emydura krefftii, has recently exhibited identical courtship display to the adult E. latisternum, but the E. krefftii seems less than enthusiastic about her suitor.

All these observations of E. latisternum are in accord with observations on other aquatic tortoises, but all are of a short neck morphology (both cryodire and pleurocline). I am not aware of any reports of courtship display in long-neck aquatic tortoises. It would seem that due to the long neck, the behaviour would need to be considerably modified as, with neck even partially extended, the male's feet would not reach the female's head. Long-neck tortoises can and often do swim with their heads completely retracted, but this would not appear to be a solution, as the head would then be at the wrong angle to the female. In any case, the head and neck would limit forward and inward movement of the front legs so much that the feet could not easily be brought near the females head. Until someone publishes observations on courtship of long-neck tortoises, the question will remain unanswered.

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#### OBSERVATIONS ON EGG-LAYING IN CHELODINA LONGICOLLIS

by Ian Hill, 62 Rawson St., Cessnock, NSW 2325

On the 20th November 1976 at 3.35pm (daylight saving time) a female Chelodina longicollis was observed using both back feet in turn to create a hole for egg deposition. The day was overcast. The observation took place in a small swamp in Kurri Kurri NSW. The area is one of cleared paddocks through which the Wallis Creek flows. The banks consist of a black soil and sand mix. Chelodina longicollis are extremely abundant in the area and in certain sections Emydura macquarii are often encountered.

The feet were used one at a time and, each time a side to side movement took place, a few drops of water were given from the cloaca, moistening the soil and making the digging easier. The legs were placed into the hole with the feet bent up resembling miniature shovels, brought back up with their load and then pushed directly backwards creating a mound at

the back lip of the hole. This continued until a depth of approximately 15cm was reached. The moistening process continued until the tortoise appeared to be devoid of liquid.

At 4.05pm the tortoise lowered her cloaca into the hole and the first egg was laid. After the first four eggs were deposited the back feet were used to position the eggs within the hole. By 4.30pm the sixteenth and final egg had been laid and the tortoise started covering the eggs by using both back legs with the feet almost clasped to pull the mound of soil over the eggs.

After covering the eggs the tortoise began to pat earth down firmly by raising the back end of the plastron to approximately 5cm in height and dropping down heavily. The sound of the plastron striking the ground was quite audible. By 4.56pm the female seemed satisfied with the job and rested for three minutes before re-entering the water.

Constant observations were kept on the nest site and on 21st February, 1977 in light drizzle, a juvenile tortoise was discovered emerging from the nest. When uncovered to take photographs two eggs were found to be added. The remaining eggs hatched successfully with the final hatchling emerging at 12.00am on 22nd February 1977.

#### Particulars of juveniles:

average weight: 3 grams. carapace-average length 2.5cm. width 2.25cm  
plastron-average length 2.0cm. width 1.25cm  
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#### NOTES ON A NEST AND HATCHLINGS OF *VARANUS ACANTHURUS*

by G.A. Husband, 21 Edward St. Guildford, NSW 2161.

The following note on the reproduction of *Varanus acanthurus* might be of interest, considering the lack of published information on the species' breeding biology.

A nest containing 8 newly hatched young was discovered by the author and fellow herpetologist the late Peter Rankin about 30km north of the Barkley Highway on the Tablelands Highway N.T. on the 4th January 1977 at about 5.00pm (C.S.T.). The habitat was red soil plain with widespread *Triodia* and short accacias (app. 2 metres high), a small limestone outcrop was also present in the area.

The actual nest was in the form of a small chamber at the base of a lateral "S" shaped tunnel, approx. 40cm below the surface (vertical depth). The tunnel was ca. 25mm in diameter at the surface and was concealed by a small flat rock. The structure was positioned on a mound of bulldozed soil on the verge of the road.

While excavating the burrow a newly hatched specimen was located about midway down the tunnel - presumably making its way to the surface. At the base of the shaft a further 3 hatchlings were taken and after a little more digging we came upon the other 4 among the 8 eggshells, covered with soil. It was apparent the chamber had been filled with soft earth and that the specimens had dug their way out.

The snout-vent lengths ranged from 63mm to 69mm the mean length being 66 mm. The tail lengths ranged from 89mm to 100mm, the mean length being 95mm (see table 1). Two of the specimens were lodged in the Australian Museum Sydney, one was kept by the author for growth studies and the remaining 5 were released at the site.

The growth rate of the specimen kept in captivity is set out in table 2.

table 1

SV (mm)	VT (mm)
67	100
65	97
69	95
66	97
64	89
65	94
63	92
67	97

table 2

DATE	SV (mm)	VT (mm)	TOTAL
4. 1.77	65	97	162
4. 4.77	85	127	212
13. 6.77	100	144	244
7. 9.77	104	160	264
11.10.77	110	170	280
13. 5.78	134	205	339
10.10.78	150	216	366
26.12.78	155	234	389
5. 3.79	155	238	393
31. 7.79	167	238	405

The following food types have been consumed:

Reptiles-Lampropholis delicata, L. guichenoti, L. mustelina, Leiopisma platynota, L. entrecasteauxii, Egernia whitei, Cryptoblepharus boutonii, Ctenotus taeniolatus, C. robustus, C. strauchii, Mor-ethia boulengeri, Carlia burnettii, Gehyra variegata, Oedura lesueurii, Heteronotia binoei.

Mammals- Mus musculus (pink and adults).

Others- Strips of meat, minced meat, Cockroaches, Grasshoppers, Crickets and Mealworms.

#### ACKNOWLEDGEMENTS

I would like to thank Mr. Richard Wells for his advice and criticism.

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#### RECORDINGS OF LITORIA MACULATA (SPENCER) FROM TWO VICTORIAN LOCATIONS

by Peter Heazelwood, 22 Eaton St., Melton South, Vic. 3338

During February of this year I took part in a survey of the vertebrate fauna of the Mount Buffalo National Park which was conducted by a group from the Monash University Biological Society at the request of the National Parks Service, Victoria.

The most significant recording was the location of a colony of Litoria maculata (Spencer) within the Park. Barker and Grigg (1977) describe these frogs as being "one of the rare and little known species from southern N.S.W. and Victoria." Their distribution has been recorded from widely scattered locations in eastern Victoria, extending into the Mt. Kosciusko region of N.S.W. (Cogger, 1975).

L. maculata was found inhabiting rock crevices around a pool at the base of a waterfall and also in rock crevices at the top of the same waterfall. When disturbed, they showed no hesitation in entering the swiftly flowing water where they proved to be strong swimmers.

I also attended a Monash University Biological Society Camp during the Easter holiday period, located in the Eildon district of Victoria. While there I was fortunate enough to discover L. maculata in two rivers in this region, the Big and the Taponga Rivers. L. maculata was found sheltering beneath rocks that were partially submerged in shallow water near the river bank. These frogs were also heard calling at about 11.00am one morning. Weather conditions were cool and overcast, with light rain falling intermittently. Specimens from both regions were forwarded to the National Museum of Victoria.

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 Page 30.



## HISSES AND CROAKS.

THE AFFILIATION: The second Convention at Whyalla S.A. last March was very well attended, and societies that could not send representatives provided taped comments, viewpoints etc. Discussions ranged from protective legislation to improving the scope and quality of Herpetofauna and all were most productive. A short report will soon be available from your society's committee. Many thanks to the Western Herpetology Group for organising the fieldwork and providing for all our needs.

The third Convention is being planned and Darwin looks like being the favoured location. It can extend over the two week school holiday period in September 1980. Graeme Gow, Curator at the Northern Territory Museum in Darwin indicated during the Whyalla Convention that many interesting one to four day field trips are possible and that hosting would present no problems. Why not plan your 1980 holidays for the third Convention?

ADELAIDE: In April the Group undertook a productive field trip into the Simpson Desert via Anna Creek and Lake Eyre. Other weekend trips have also been made.

Members have been involved in three educational displays of reptiles in schools and elsewhere, and Chris Harvey and Darryl Levi deserve congratulations for attracting 65,000 visitors. The Cleland Conservation Park display on the reptiles and frogs of the Mount Lofty Ranges has proved very popular and over 60,000 people have seen it. Geoff Coombe and other members put in long hours to set up the displays. Most of the exhibited reptiles have bred successfully.

A Junior Section of the Group is being organised and run by Chris Harvey and meetings are being attended by over fifty people regularly.

The Group was recently granted \$1000 by the S.A. Government to further its research work. Several useful items have been purchased to add to the field work equipment.

MELBOURNE: The Victorian Herpetological Society has concentrated its field trip program on localities near Melbourne; the trips have a training function as many of the members are keen but there are only a few who have the necessary skills. Our committee structure has been modified to allow a greater emphasis to be placed on field work. Our educational efforts are presently being aimed towards Scout groups in the Melbourne metropolitan area and Ballarat and we aim to address at least 30 groups commencing September. We plan to extend the service to schools in 1980.

Members are responding to our encouragement to write articles for Herpetofauna but this means there is less effort available to write material for the VHS Newsletter. Could readers please forward items and articles (either original or extracts) which are not suited for Herpetofauna but which could be put into the Newsletter.

There has been no further development in the introduction of protective legislation and regulations in Victoria however there are strong rumours that something could happen in September 1979.

NEW ZEALAND: The Society has been involved with the Junior Naturalists organisation in running local field trips and educational talks. Ongoing field trips are being made by several members with continuing success.

Committee member John West has devised a record system which will assist members in noting details of their captive specimens. This is of particular importance because the keeping and study of captive lizards is a major activity in New Zealand. The Society is distributing printed record sheets to members who require them. Members are being asked to forward any lizard specimens that die in captivity into a central collection that will be available for study and research purposes.

During August 1979 the theme for New Zealand's Conservation Week is "Endangered Species" and the Society is working towards furthering public awareness of the New Zealand lizards which are endangered. The Society has also been approached to assist in preparing a New Zealand Red Data Book of endangered species which is planned for completion by 1981.

QUEENSLAND: There's superb news from Townsville - the North Queensland Herpetological Society has had two meetings. Elections are planned later and as yet no fees have been set. Two field trips have already been undertaken, and the Queensland National Parks and Wildlife Service is providing valuable guidance to the new group.

SYDNEY: When the survey of the Colo River area (now the Wollomai National Park) is finalised we plan to embark on a limited reptile and frog survey of areas affected by the woodchip industry on NSW's south coast.

About 2000 people attended an exhibition of reptiles (mainly snakes) which we ran in conjunction with the NSW National Parks and Wildlife Service. It ran for ten days in June at Ku-Ring-Gai Chase National Park and is part of our exhibition program designed to further public awareness of reptiles and frogs. We now have over \$1000 worth of display equipment and another is planned for September. The Society was praised by the Minister for Planning and Environment on its educational efforts. The Society recently celebrated its 30th birthday.

We plan to publish small booklets on herpetological matters using the funds raised by our public exhibitions.

WHYALLA: After getting over the flurry of herpetological activity of the Convention we are keenly looking forward to the next one which will hopefully be in Darwin. We have started fund raising activities to help finance our members planning to make the long trip.

President Peter Mirtschin recently visited the USA and has brought back plenty of news and information on displays, keeping and herp activities in America.

The Whyalla Fauna Park is facing some financial problems with upgrading some of the display cages. Additional holding cages are also urgently needed. The Group plans to undertake more systematic collecting and forwarding of specimens to the South Australian Museum and to keep a series of distribution maps that can be upgraded as range extensions are made.

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# Notes to Contributors.

"Herpetofauna" publishes original articles on any aspect of reptiles and amphibians. Articles are invited from any interested authors; encouragement is given to articles reporting field work and observations.

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Authors are responsible for the accuracy of the data presented in any submitted article. Current and formally recognised taxonomic combinations should be used unless the article is itself of a taxonomic nature proposing new combinations or describing new species. Upon publication, copyright in the article (including illustrations) become the property of the Affiliation. The original illustrations will be returned to the author, if requested, after publication.

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One copy of the article (including any illustrations) should be submitted, the author retaining a second copy. All material should be typewritten or clearly hand-written and double spaced. Grammar and punctuation should be checked and all pages must be numbered consecutively. The metric system should also be used throughout. All scientific names and subheadings should be underlined. The author's name and address should appear under the title. Latitude and Longitude of localities mentioned should be indicated.

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Illustrations (drawings, maps or photographs) should be twice the anticipated published size if possible. Drawings should be in Indian ink on high quality, matt white paper. Authors should retain a copy of each illustration.

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Any references made to other published material must be cited in the text, giving the author, the year of publication and the page numbers if necessary, e.g. Jones (1968, p24). At the end of the article full reference should be given. (See this Journal).

## 4. PROOFS

If any changes, other than minor ones, need to be made to the article, a proof with suggested changes will be sent to the author for his revision. Proofs should then be re-submitted by the author as soon as possible.

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